

# Claims

- [c1] A method of providing electrical isolation in a separation by ion implanted oxide (SIMOX) substrate, comprising:  
implanting ions into a substrate in a base dose implant conducted at a first energy level;  
implanting ions into said substrate at a second energy level in a second implant while said substrate is held at room temperature; and  
annealing said implanted substrate to cause said ions to be redistributed in said substrate.
- [c2] The method of Claim 1 wherein said substrate comprises single crystal silicon.
- [c3] The method of Claim 1, wherein said implanted ions comprise oxygen ions.
- [c4] The method of Claim 1, wherein said second energy level is lower than said first energy level.
- [c5] The method of Claim 2, wherein said implanted ions comprise oxygen ions.
- [c6] The method of Claim 5, wherein said implanting and said annealing result in formation of a continuous buried oxide (BOX) layer which provides electrical isolation for a silicon-on-insulator layer of said substrate.

- [c7] The method of Claim 1, wherein said first and said second energy levels are in the range of 40 to 240 KeV.
- [c8] The method of Claim 1, wherein a lower dosage of ions are implanted in said second implant than in said base dose implant.
- [c9] A method of providing electrical isolation in a separation by ion implanted oxide (SIMOX) substrate, comprising:  
implanting ions into a substrate in a plurality of base dose implants conducted at a plurality of different energy levels;  
implanting ions into said substrate in a second implant at a second energy level while maintaining said substrate at room temperature; and  
annealing said implanted substrate to cause said ions to be redistributed in said substrate.
- [c10] The method of Claim 9, wherein each of said base dose implants is conducted at a lower energy level than the implant which precedes it.
- [c11] The method of Claim 10, wherein said second energy level used in said second implant is lower than any of said energy levels used in said base dose implants.
- [c12] The method of Claim 9, wherein said cumulative implant dose from all said base dose implants is in the range of  $1 \times 10^{16}$  to  $4 \times 10^{17}$  ions/cm<sup>2</sup>.

[c13] The method of Claim 9, wherein a plurality of said second implants are conducted each at a different energy level that is also different than said energy levels at which said plurality of base dose implants are conducted.

[c14] The method of Claim 13, wherein each said implant is conducted at a lower energy level than any of said implants preceding it, such that said second implants are conducted at energy levels lower than any of said base dose implants.

[c15] The method of Claim 13, wherein said plurality of said second implants provide a total accumulated ion implant dosage that is lower in value than a total accumulated ion implant dosage provided by said plurality of base dose implants.

[c16] A method of providing electrical isolation in a separation by ion implanted oxide (SIMOX) substrate, comprising:  
implanting ions into a substrate in a base dose implant conducted at a first energy level;  
implanting ions into said substrate in a plurality of subsequent implants during which said substrate is held at room temperature, each of said plurality of subsequent implants being conducted at a separate energy level; and  
annealing said implanted substrate to cause said ions to be redistributed in said substrate.

[c17] The method of Claim 16, wherein each of said subsequent

implants is conducted at a lower energy level than the implant preceding it.

[c18] The method of Claim 17, wherein said first energy level at which said base dose implant is conducted is higher than any of said energy levels at which said subsequent implants are conducted.

[c19] The method of Claim 17, further comprising cleaning a surface of said substrate between each said implant.

[c20] The method of Claim 16, wherein a plurality of said base dose implants are conducted each at a different energy level that is also different than said energy levels at which said plurality of said subsequent implants are conducted.